Post-graduation Economic Status of Master's Degree Recipients: A Study of Earnings and Student Debt

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This study examined the employment activity of master's graduates and the student debt they carry into the workplace over the early years following graduation. State unemployment insurance records were merged with student data files to determine the relationship between academic achievement, financial success, and debt burden of these graduates.

Quarterly earnings from the first two years following graduation were regressed on age, grade point average, academic major, gender, race, and industry. Major, industry, age, and grade point average were significant in both years examined.

Student debt was regressed over grade point average, gender, race, age, and academic major. Major, grade point average, and age were significant.

Excess student debt—calculated based on total student loan debt and earnings—was regressed on academic major, industry, grade point average, age, gender, and race for the first year following graduation. Major, grade point average, gender, and industry were found significant.

As educational costs rise and dependency on loans grows, the low earning potential of some academic majors affects enrollment decisions. Failure to properly evaluate debt burden and prospective earnings can have long-term financial consequences for borrowers.

The post-graduation effects of academic achievement upon earnings and the amount of student debt are of obvious interest to those pursuing graduate education. Students want to know what earnings to expect upon graduation, what kind of debt burden they will carry, and the role academic major and choice of employment industry will have on their economic success in the first years following graduation. Is it wise to incur debt to finance a master's degree? Is there a debt threshold students should not exceed? Will earnings be adequate to pay off student loans? These financial considerations affect choice and the willingness to finance graduate education with loans.

In the 1999-2000 academic year, there were 2.7 million students enrolled in graduate and professional schools throughout the United States. More than half were enrolled in master's degree programs, with the largest numbers in business administration and education. The average annual budget for master's-level students at public doctoral-degree granting institutions was $19,636, with 24 percent of those students relying upon student loans to cover their costs. The average loan was $9,969

(Choy & Geis, 2002). Student loans have become essential components of financial assistance for graduate students, and a growing area of concern.

For those financing their education, Federal Perkins Loans and Stafford Loans are used heavily to support graduate-level studies—so heavily that federal loans are the greatest source of financial aid. Scherschel (2000) found that from 1995 to 1999, the average graduate student indebtedness from Stafford Loans increased at a compounded rate of 19.6 percent. Students pursing a master's degree can borrow up to $40,000 through the Perkins Loan program and $138,500 through the Stafford program (U.S. Department of Education, 2003).

Because debt burden may significantly affect quality of life following graduation, assessing the costs of education against future income and ability to repay is a necessity. For those entering graduate programs, realistic projections of earnings and financial needs are important considerations.

Literature Review

While numerous studies have addressed the impact of the college experience on post-college earnings, most have examined undergraduate degree recipients and community-college graduates (Brown & Choy, 1988; Peterman, 1999; Wonacott, 2001; Yang & Brown, 1998; Sanchez, Laanan, & Wiseley, 1999). Studies on baccalaureate graduates found specific factors that influenced earnings in the early years of their careers, including academic achievement, major, age, gender, race, and occupation (Pascarella & Terenzini, 1991; Goodman, 1979; Blaug, 1991; Angle & Wissmann, 1981; Smart, 1988; Reed & Miller, 1970; McMahon & Wagner, 1981). A recent study of undergraduate degree recipients found age, major, and industry of employment to be significant predictors of earnings. Neither race nor gender was significant, and grade point average failed to have a positive effect on earnings (Donhardt, 2004).

While the economic benefits of higher education have been analyzed, the issue of student debt has been largely ignored in early studies (Leslie & Brinkman, 1986; Pascarella & Terenzini, 1991; Becker & Chiswick, 1966; Freeman, 1975; Becker, 1964; Carnoy & Marenbach, 1975). Choy and Geis (2002) did find differential borrowing patterns among master's students, with science and engineering students less likely to borrow than those in the humanities. King and Frishberg (2001) found students graduating with disturbing levels of debt and experiencing alarm upon discovering they had amassed greater debt than expected. Heller (2001) found differences in borrowing among races, and Scherschel (2000) examined debt burden by comparing monthly loan payments with measures of borrowers' income.

Research Procedures

The present study merges state unemployment insurance records with university data to examine the earnings of master's degree

recipients and their capacity to repay educational debt in the years immediately following graduation.

Research Questions

Three basic research questions deal with the prediction of earnings, debt accumulation, and excess debt.

- *Predicting earnings*: Controlling for age, grade point average, gender, and race, do industry and academic major predict quarterly earnings?
- *Searching for correlates of student debt accumulation*: Controlling for grade point average, gender, race, and age, is academic major associated with student debt accumulation?
- *Analyzing the relationship between earnings and student debt for those who are employed and carrying student debt*: Controlling for industry, grade point average, age, gender, and race, is there a relationship between academic major and excess debt?

Data Sources

The individuals examined in this study graduated from a state-supported Carnegie Doctoral/Research - Extensive university between the summer of 1998 and the spring of 2002. The university is comprised of nine colleges and schools, with an annual budget of over $261 million and an enrollment of 19,797 for the fall of 2002. In that term, 3,596 students were enrolled in master's degree programs at the university: 60 percent of the master's matriculants were women; 54 percent were Caucasian. The institution awards as many as 980 master's degrees a year, with most alumni living and working in the state.

Unemployment insurance records accumulated by the state Department of Labor and Workforce Development and student records from university student files were merged by student Social Security number. The Department of Labor and Workforce Development tracks the earnings of every individual employed in the state and covered by the Unemployment Insurance Program. On a quarterly basis, employers report their employees' earnings received during the period, the employer's identification, and the industry categorization from the Standard Industrial Classification Code. University records provided data on student demographics, academic achievement, and accumulated debt for all degree recipients. Over 80 percent of the graduates were found on the Department of Labor and Workforce Development file and 11 percent had the additional match with the university financial aid file (see Table 1).

Variable Development

The university records age, race, gender, and grade point average information at the time of graduation. For this study, race is coded dichotomously as Caucasian or non-Caucasian.

Industry is coded from the Standard Industrial Classification Code provided by the United States Department of Commerce. Student loans reflect cumulative amounts accrued while enrolled in the master's program as well as previous undergraduate and graduate programs.

Relative measures, such as earnings by quarters following graduation, were created respective to the graduation date of the student (e.g., Quarter 1 is the quarter in which the individual graduated). All earnings were adjusted to the future value of 2002 using the Consumer Price Index so that comparable assessments could be made over the various periods.

Table 1
Total Number of Master's Degree Graduates and Number Matched with the Labor and Workforce Development and Financial Aid Files

	Summer 1998 to Spring 1999	Summer 1999 to Spring 2000	Summer 2000 to Spring 2001	Summer 2001 to Spring 2002	Total	Percentage of Total in Study
Master's Graduates	928	981	947	880	6,393	100%
Master's Graduates Matching Labor & Workforce Development File	778	849	785	636	5,203	81.39%
Master's Graduates Matching Labor & Workforce Development File and Financial Aid File	107	215	200	211	733	11.47%

Results

Research questions were addressed using analysis of covariance techniques. Extreme outliers for earnings of over $1,000,000 a year and under $9,214, which is the poverty threshold for a single individual under 65 years of age in 2001 (Proctor & Dalaker, 2002), were removed from the study. Individual observations were dropped when there were fewer than five observations having the same major.

Predicting Earnings
Controlling for age, grade point average, gender, and race, do industry and academic major predict quarterly earnings? Annualized earnings from the end of the first and second years were regressed over industry and academic major while controlling for age, grade point average, gender, and race. Models were established for both years. There were 1,166 observations in Year 1 and 530 in Year 2. Individual observations were dropped when there were fewer than five observations having the same industry.

The amount of variance explained by the models was 29.2 percent for Year 1 (5th Quarter) and 36.8 percent for Year 2 (9th Quarter). The models achieved significance ($\alpha = .05$) in both years, and major, industry, age, and grade point average were significant. In the first year, age accounted for $643 of the earnings while in the second it was responsible for $642. In the first year, grade point average resulted in $794 per tenth of a point.

Table 2
Earnings Differences Between Selected Industries
Least-Squares Means

YEAR 1 Industry	Least Squares Means	YEAR 2 Industry	Least Squares Means
Real Estate	147,978	Electronic and Other Electrical Equipment, except Computers	96,183
Electronic and other Electrical Equipment, except Computers	74,951	Wholesale Trade—Durable Goods	76,624
Wholesale Trade—Durable Goods	64,368	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods; Watches and Clocks	67,903
Chemicals and Allied Products	63,372		
Securities and Commodities Brokers, Dealers, Exchanges	62,729	Chemicals and Allied Products	66,501
Auto Dealers and Gasoline Service Stations	60,913	Wholesale Trade—Non-Durable Goods	60,846
Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods; Watches and Clocks	60,637	Paper and Allied Products	59,774
		Electric, Gas, and Sanitary Services	59,289
Electric, Gas, and Sanitary Services	60,058	Securities and Commodities Brokers, Dealers, Exchanges	58,880
Motor Freight Transportation and Warehousing	56,996	Transportation by Air	58,609
Wholesale Trade—Non-Durable Goods	55,812	Business Services	57,206
Transportation by Air	55,244	Depository Institutions	56,089
Business Services	52,437	Miscellaneous Retail	55,254
Paper and Allied Products	49,131	Engineering, Accounting, Research, and Management	53,461
Hotels, Rooming Houses, and Camps	48,817	Holding and Other Investment Offices	48,218
Communications	48,450	Social Services	48,217
Health Services	46,350	Printing, Publishing, and Allied Industries	47,790
Engineering, Accounting, Research, and Management	45,462	Health Services	45,783
Depository Institutions	44,272	Administration of Human Resources Programs	44,992
Social Services	43,863	Educational Services	44,460
Miscellaneous Retail	42,399	Executive, Legislative, and General Government except Financial	43,651
Executive, Legislative, and General Government except Financial	41,606	Insurance Carriers	32,807
Educational Services	41,241		
Printing, Publishing, and Allied Industries	41,168		
Membership Organizations	39,523		
Administration of Human Resources Programs	38,285		
Eating and Drinking Places	35,594		
Insurance Carriers	35,530		
Holding and Other Investment Offices	35,226		
Transportation Services	31,549		
Amusement and Recreation Services	22,378		

In the second year it accounted for $899. There was no significant effect associated with gender or race in either year.

The least-squares means (calculated with all covariates at their mean values) are shown in Tables 2 and 3. The assumption is made that the main effects of major and industry are independent of each other. No interactive effects were attempted because of the perceived lack of power in the model to find interaction.

Table 3
Earnings Differences Between Selected Majors
Least-Squares Means

YEAR 1 Major	Least Squares Means	YEAR 2 Major	Least Squares Means
Business Administration	59,290	Business Administration	65,586
Mathematical Sciences	55,235	Mathematical Sciences	61,610
Electrical Engineering	54,086	Engineering Technology	59,614
Accounting	53,008	Electrical Engineering	58,408
Civil Engineering	52,818	Health Administration	56,386
Leadership and Policy Studies	49,742	Leadership and Policy Studies	53,821
Health Administration	48,319	City and Regional Planning	48,752
Public Administration	47,589	Accounting	45,706
Criminology and Criminal Justice	43,532	Instruction and Curriculum Leadership	43,199
Instruction and Curriculum Leadership	42,682	Audiology and Speech Pathology	41,704
Engineering Technology	41,805	Journalism	40,156
Exercise and Sport	40,622	Communication	37,630
Geography	40,219	Consumer Science and Education	36,850
Clinical Nutrition	39,370	English	31,236
Audiology and Speech Pathology	38,558	Anthropology	27,034
Psychology	38,411		
City and Regional Planning	37,769		
Music	36,989		
Educational Psychology and Research	35,479		
Counseling and Personnel Services	34,799		
Journalism	34,690		
Consumer Science & Education	33,915		
History	33,420		
English	33,165		
Romance Language	33,075		
Creative Writing	32,507		
Biology	32,199		
Communication	31,230		
Liberal Studies	28,321		
Sociology	25,076		
Anthropology	23,271		

Tables 2 and 3 (controlling for all other factors in the models) show average earnings by industry and major, respectively. For example, in the first year those working in the real estate industry earned an average of $147,978, while those in amusement and recreation services earned $22,378. In the second year, those who majored in anthropology earned $27,034, while those in business administration earned $65,586. Because industrial and academic-major categories with fewer than five observations were not reported, some categories were included in one year and not the other. For example, in the first year real estate met the criterion, but was dropped from the analysis in the next year, when the number of observations fell below five.

Searching for Correlates of Student Debt Accumulation
Controlling for grade point average, gender, race, and age, is academic major associated with student debt accumulation? Are there correlates associated with debt accumulation? Are certain majors prone to accumulate greater amounts of student debt than others? To help answer these questions, student debt was regressed over academic major while controlling for grade point average, gender, race, and age. All master's degree graduates with student debt were included, resulting in a sample size of 703. The model explained 16.0 percent of the variance. While gender and race were not significant at the a = .05 level, age, grade point average, and major were. Older graduates borrowed more than younger. Controlling for other factors, age accounted for $278 per year and grade point average accounted for a reduction of $1,687 per tenth of a point.

Table 4 lists student debt by major in descending order. The least-squares means show average debt while controlling for the other variables in the model. Those receiving a master's degree in history, for instance, borrowed an average of $50,547, while accounting majors averaged $16,000.

Analyzing the Relationship Between Earnings and Student Debt for Those Who are Employed and Carrying Student Debt
Controlling for industry, grade point average, age, gender, and race, is there a relationship between academic major and excess debt? An algorithm was constructed to ascertain excessive debt given the earnings of master's degree recipients. Excess debt is the difference between debt at graduation and the lender-recommended debt level computed as the present value of an annuity with the payment amount based upon annualized earnings. The following formula describes the computation (Harrast & Donhardt, 2002).

$$\text{Excess debt} = \text{Debt at graduation} - \sum_{k=1}^{n}\left(\frac{1}{1+\frac{r}{m}}\right)^{k} a$$

where n is the number of payments (120), r is the nominal interest rate (7%), m is the number of compounding periods per

year (12), k is the payment number (1-120), and a is the payment amount (8% of yearly earnings/12).

Because many students overestimate their future income and underestimate the total costs of their loans, borrowing guidelines have been suggested. It has been recommended that student loan repayments be limited to 8 percent of gross income (King & Frishberg, 2001; Heller, 2001; Scherschel, 2000).

Excess debt was calculated based upon earnings at the end of the first year following graduation (5th Quarter) and total student debt at graduation. Excess debt was regressed on academic major, industry, grade point average, gender, race, and age. All master's degree recipients from the university who had student debt and were covered under the unemployment insurance system in the state were included. The first-year measure

Table 4
Student Loan Debt Means at Graduation for
Master's Degree Recipients, by Academic Major

Major	Least Squares Means
History	50,547
Creative Writing	40,880
Art History	38,996
Liberal Studies	37,239
English	36,671
Theatre/Communications	35,165
Anthropology	34,472
Philosophy	33,375
Psychology	32,957
Communication	32,874
Music	32,591
Journalism	32,535
Counseling and Personnel Services	30,805
Sociology	30,737
Audiology and Speech Pathology	27,346
Public Administration	26,275
Criminology & Criminal Justice	26,150
Clinical Nutrition	25,493
Biology	25,346
Geography	24,498
Instruction and Curriculum Leadership	24,469
Art	24,117
Health Administration	23,692
Exercise and Sport	23,532
Business Administration	21,949
Leadership and Policy Studies	20,366
Educational Psychology and Research	17,284
Accounting	16,000

is critical because many loan deferments expire by then, and lenders expect loan repayments to begin.

The model, significant at the $\alpha = .05$ level, explained 49.5 percent of the variance. There were 227 observations. Major, industry, gender, and grade point average were significant. Race and age were not. Grade point average affected excess debt by a reduction of $1,709 per tenth of a grade point. Women had $5,771 more excess debt than men. Again, the assumption is made that the main effects of major and industry are independent of each other. No interactive effects were assessed because of the perceived lack of power in the model to find interaction.

The least-squares means of excess debt are reported in Table 5. A negative value shows that earnings are able to support student debt. Graduates with positive excess debt surpass recommended borrowing levels of 8 percent. Student loan borrowers with master's degrees in audiology and speech pathology, English, counseling and personnel services, and anthropology had more unsupportable debt than their peers in other majors in the first year of their careers.

Table 5
Amount of Excess Student Loan Debt for Master's Degree Recipients in the First Year After Graduation, by Academic Major

Major	Least Squares Means
Accounting	-18,207
Business Administration	-13,673
Health Administration	-6,295
Leadership and Policy Studies	-3,148
Instruction and Curriculum Leadership	-1,231
Audiology and Speech Pathology	7,317
English	15,108
Counseling and Personnel Services	15,545
Anthropology	18,214

Discussion

The effects of academic major and industry upon earnings, and major upon total debt burden and excess debt were analyzed in an examination that merged state unemployment insurance records with student data files at a state-supported Carnegie Doctoral/Research - Extensive university. Although the study was limited to graduates from one institution employed in one state, there are likely inferences that can be drawn to the larger population of master's graduates throughout the United States.

The selection of major and industry of employment are important in determining earnings in the years immediately

following graduation. Large differences in earning power exist between majors and across industries. Furthermore, those in certain majors accrue larger student debt than their cohorts, even when gender, race, grade point average, and age are controlled for. To find the most accurate measure of the effect of student debt on recent master's graduates, however, earnings and debt accumulation must be considered together. With recommended loan payments limited to 8 percent of gross salary, major was found to be a key predictor of excess debt.

The prospects of graduates facing unsupportable debt after graduation is reason for concern. High levels of debt can adversely affect the quality of life following graduation. Those who fail to adequately manage their debt may find themselves in financial troubles from which they cannot be extricated easily. Students who use loans to finance their education need to be cognizant of escalating costs, recommended borrowing limits, and their potential to repay their debts in the future. Failure to properly evaluate debt burden and prospective earnings can have deleterious effects with financial consequences that last a lifetime. Keeping loans within lender-recommended limits, however, can be somewhat difficult even for well-informed individuals.

Loans help make it possible for large numbers of graduate students to obtain their degrees. But as educational costs rise and dependency upon loans grows, the low earning potential of some academic majors and the limited financial opportunities afforded by some industries affect choice. When faced with high debt and low earning prospects, career options become limited (Equal Justice Works, 2002; Heller, 2001). Students who desire to pursue an educational program may be dissuaded because of the fiscal considerations.

It is reasonable to expect enrollees in graduate programs to have expectations of future financial attainments resulting from an investment of their time and energy. Realistic estimates of earning power and supportable debt accumulation specific to major are necessary, because there are demonstrable inequities across academic programs and between industries. Albeit localized, the present study helps meet those needs.

Using the Department of Labor and Workforce Development and university data to investigate earnings and debt is preferable to asking individuals through surveys to recall work history and salaries over past years. Replication of this study on a larger scale would yield obvious benefits.

Students who use loans to finance their education need to be cognizant of escalating costs, recommended borrowing limits, and their potential to repay their debts in the future.

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